Chemical and Biological Defense Information Analysis Center

CBIAC

Serving the CB Defense Community

NEWSLETTER

Spring 1998 Vol.4 No.2

A U.S. Department of Defense Information Analysis Center (IAC) sponsored by the Defense Technical Information Center (DTIC)

Analysis and Validation: A Perspective for Hazard Models

Peter B. Merkle, Ph.D., E.I.T.

Dr. Peter Merkle is Special Assistant to COL Carmen J. Spencer, Director of the Chemical/Biological Defense Program, and principal advisor for Modeling and Simulation issues to BG (Ret.) Walter L. Busbee, Deputy for Counterproliferation and Chemical/Biological Defense, Office of the Secretary of Defense. He is assigned to DoD by the Department of Energy from Sandia National Laboratories, and is the DoD Chair for the Counterproliferation Program Review Committee (CPRC) Modeling and Simulation Working Group. His previous work experience has included design and field validation of engineered and natural systems models and decision analysis software for regional and meso-scale environmental pollution, reactor design, catalysis, and electronic component manufacturing. In his article, Dr. Merkle shares his concerns and recommendations for NBC hazard modeling.

A quantitative hazard model is a mysterious thing. In order to validate a system's function or safeguard human health and environmental quality, it must reliably represent the consequences of events which rarely occur. It does this by distilling the "real world" of what could actually happen down to some practical level of conceptual and mathematical approximation. This is then packaged into a useful form such as a table, nomograph, or computer code. However, collecting field data from horrific events to evaluate the fidelity of a model may place at risk the very things it is designed to help protect. This is particularly true for models used to assess risks from deliberate or accidental releases of hazardous nuclear, biological, or chemical (NBC) materials. It is clear that the root purpose of NBC hazard models implies a tremendous *inherent* primary penalty for any intrinsic errors of optimistic prediction, let alone errors in human interpretation of results. In certain instances of NBC model failure, catastrophic loss of human life and widespread environmental degradation could occur. A level of "conservative" bias is appropriate for these models, but an unconstrained bias impairs model fidelity to the final arbiter, the "real world". It may in fact render the prediction dangerous if it needlessly induces mass civilian evacuation or impairs battle capability and troop mobility, resulting in avoidable casualties. The builder of NBC hazard models, unlike a licensed architect or structural engineer, is not likely to face statutory responsibility for model failure. Given the potential consequences of error, the responsible NBC hazard modeler does use quantitative analytical techniques to understand a model's functional properties and develop creative insights. A quantitative analysis also allows model results to be viewed in a larger comparative context by sponsors and users, who must eventually answer the question "Which model should I use?". Before outlining a few basic analysis techniques and how they may contribute to model validation, a number of significant questions are in order.

Who are NBC hazard model users, and how might we better understand their needs and responsibilities? Consider the following scenarios where models suddenly become invaluable tools, and imagine how one would proceed under the circumstances:

- Fire Chief Jones learns that a forklift accident has ruptured a large chlorine gas tank at the water treatment plant. Her decisions will affect the 8,000 citizens in their homes, schools, and hospital who are 7 km downhill but currently upwind of the release. She has a pre-prepared hazard planning map based on downwind conditions, but she isn't sure it allowed for a release of this size.

- Chemical Officer Smith receives a report that unknown chemical munitions may have detonated 10 km inshore from an amphibious landing site where his 2,000 Marines have hit the beach under fire, and Navy vessels stand 5 km offshore. He has two options for hazard plotting, a standard chart overlay and a PC-based model. He can't get any weather data from the overloaded data link, but he has today's forecast wind field from last night's estimate.

"Analysis and Validation: A Perspective for Hazard Models"

Continued on page 2

On the Inside

CBIAC Welcomes Dr. James M. King as its New Deputy Director

On March 31, 1998, Dr. James M. King was appointed Deputy Director of the CBIAC. Dr. King is responsible for the CBIAC's Core program, including acquisition and processing of documents, analysis and dissemination of information, information support systems, data integration, information analysis, and satellite operations. Dr. King has over 21 years of management and research experience in chemical defense, aviation and ground systems human factors, and studies and analyses, and has conducted research and occupied management positions in Army Material Command (AMC) and Army Medical Command (MEDCOM) laboratories and activities. He has published numerous articles and technical reports on a variety of topics. Dr. King has worked extensively with the international community through conferences and NATO research study groups.

While on active duty with the U.S. Army, Dr. King held many key positions in the Army research community. His assignments included research positions at the U.S. Army Medical Research Institute of Chemical Defense (USAMRICD) and the Biomedical Laboratory (its predecessor), the Health Care Studies and Clinical Investigation Activity, the Human Engineering Laboratory, and the Aeromedical Research Laboratory. His management assignments include Chief of the Behavioral Research Division and Commander/Deputy Director at the Human Engineering Laboratory, Senior Staff Officer at the Medical Research and Material Command, a Pentagon internship, and Chief of the Research Operations and Pharmacology Divisions at the USAMRICD. In these positions, he was responsible for the management of critical research programs with numerous government, industrial, and academic performers.

"Analysis and Validation: A Perspective for Hazard Models"

Continued from page 1

- A military intelligence team is studying options for destruction of an underground storage depot holding several tons of an illegal biological toxin agent in a bulk tank. One Allied city has been attacked, with over 3,000 casualties. The team has been asked if the tank can be destroyed safely without risk to 250,000 noncombatant civilians in a nearby city. There is little information on the depot facility structure, but weather forecasting data is very good. The agent has never been studied in detail, but it may degrade rapidly in sunlight. Little is known about human dose response.

These examples are certainly food for thought. It is often too easy to forget the human consequences of all the complex equations derived in the quest for a better model. We have no choice but to conclude that model analysis and model validation are inseparable companion efforts, mainly for the reasons depicted in the user scenarios. When employed for their intended purposes, few if any NBC models will have perfect input information, and the consequences of that fact must be understood in advance by both the modeler and the user. The words "analysis" and "validation" themselves have many meanings, depending upon the context and the audience. The DoD Verification, Validation and Accreditation (VV&A) Recommended Practices Guide describes many validation techniques, but first states that "…validation ensures that a simulation conforms to a specified level of accuracy when its outputs are compared to some aspect of the real world". It also quotes DoDD 5000.99: "…validation is the process for determining the degree to which a model is an accurate representation of the real world *from the perspective of the intended uses of the model*." Probabilistic model outcomes are appealing as a remedy for uncertainty of input data. While such outputs can offer decision-makers additional insight, any inherent primary error still remains for the underlying prediction algorithm. (Note that *any* quantitative fate and transport code may produce probabilistic output by systematic input parameter variation in a Monte Carlo analysis.)

From an engineering perspective, one type of validation method is truly paramount: the quantitative analysis of the model prediction in light of whatever useful test data is available. Thus, NBC hazard model validation must rely upon quantitative analysis as the fundamental basis for reliability. At some definitive point, the modeler should describe in mathematical terms, without bias or embellishment, how the output of a model (including internal error estimates such as mass balance) compares with available sets of observations and governing physical laws. In the absence of such quantitative analysis, sweeping statements such as "the model compares favorably with data" or "the model shows good agreement, and is excellent" are not well founded. Explanations of the lack of fit are likewise enhanced by quantitative treatment rather than the listing of caveats related to poorly performing sensors, bad weather data, and similar real or imagined quirks of the field test conditions.

Unfortunately, no single analytical technique is acknowledged and accepted as completely sufficient and authoritative, and just like models, the techniques themselves may become too complex and arcane for the model user to appreciate and use. One relatively easy and by no means exhaustive technique proceeds from ordinary least-squares analysis, and provides a common starting point for assessing and comparing model behaviors and fits to field data (Refs. 1 - 3). It is most appropriate for the formal *calibration* of a model in which one or more unknown parameter values are adjusted to obtain a "best fit" to a set of known field data. In the case where all parameter values are known or assumed to have default values, the fitting process is not needed. Then, the *a priori* model prediction is used to quantitatively *validate* the model's performance in the test regime under study and to understand the consequences of imperfect input information. With a larger series of *a priori* field trial predictions, general model behavior over a wide regime of potential usage conditions may be quantitatively described. While ad hoc "model excursions" and nonsystematic parameter variation studies are common in model analysis, such a documented formal theory and procedure is desirable.

For the NBC hazard model, parameter variation for duration of release, wind vector, terrain gradients, dispersion rates, and assumed time and space scales may still be studied, and relative importance assigned to needs for areas requiring investment to obtain precise field input data. Internal model default parameters such as gridding

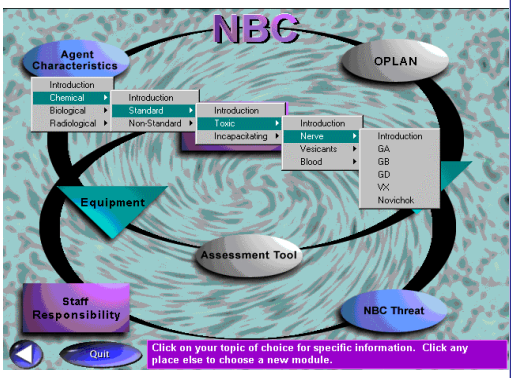
"Analysis and Validation: A Perspective for Hazard Models"

Continued on page 11

Army Chemical School Develops NBC Tool for Combatant Command Staffs

In response to a GAO report assailing the Chemical and Biological Defense Readiness of U.S. Ground Forces, the U.S. Army Chemical School, through CBIAC Technical Area Tasks (TAT) 166, has developed a CD-ROM that will assist the Combatant Commands with assessing and sustaining their NBC readiness at the strategic level. The CD-ROM is extremely user-friendly and is designed to be both informational and educational.

The interactive CD-ROM includes modules on the World-wide NBC Threat, Chemical and Biological Agent Characteristics, Joint NBC Defense Equipment, Service NBC Defense Units and Capabilities, Commander -In-Chief (CINC) Staff NBC Responsibilities, and the Universal Joint NBC Task List (UJTL). Also featured are an NBC Assessment Tool and Strategic level OPLAN and Annex samples which address NBC defense.



The "Windows 95" design of each of the modules allows a user to rapidly access desired information. Accordingly the main module screen provides users the opportunity to select the specific module which contain information they require. Further, upon entering a module users then have a choice of going into a module as far as they would like until they find the specific information required. The user is also able to print the screen if a hard copy of the information is needed. Generally, within "two clicks" a user can get to just about anywhere on the CD-ROM.

The World-Wide NBC Threat Module: The World-Wide NBC Threat Module (unclassified) is broken down into the Combatant Commands' Areas of Responsibility. A user can click on the Combatant Command and the "threat" countries appear. Click on a "threat" country of interest and you can find out about the country's suspected NBC threat capabilities and suspected delivery capabilities. Command's having a World-Wide threat are led to a World-Wide overview.

Chemical and Biological Agent Characteristics Module: The Chemical and Biological Agent Characteristics module allows a user to access information about chemical agents (standard and non-standard), biological agents, select industrial hazards and depleted uranium. Protection, detection, persistence, treatment, decontamination, physical state/odor and rate of action information are included in the module. Staff planners will find this module useful in understanding how a particular agent can affect an operation.

Joint NBC Defense Equipment Module: The Joint NBC Defense Equipment module allows a user to access information about each of the service's fielded and developmental NBC defense equipment. Equipment categories include detection, protection, decontamination and obscuration. Information available includes capabilities, applicable references and stock numbers. CINC planners will find this module useful in helping them understand the capabilities and needs of their sister services.

Service NBC Defense Units and Capabilities Module: The Service NBC Defense Units and Capabilities module includes information about each service's NBC Defense and Health Services Support organizations, along with their associated capabilities. CINC planners have commented that this module is particularly helpful in developing TPFDL's and lift requirements.

CINC Staff NBC Responsibilities Module: The CINC Staff Responsibilities Module was designed to assist the CINC staffs' in preparing for an NBC capable adversary. The menu allows for a particular staff section (e.g., J-5) to view a summary paragraph of the responsibilities inherent to that staff regarding NBC. Also, at the bottom of each screen there are "two hot buttons." These may be used to link the staff to the UJTL associated tasks or NBC mission analysis (NBC Assessment Tool) screens.

NBC Assessment Tool Module: The assessment tool module was developed was developed during NBC Assistance Visits to unified commands. It is included to assist principal staff elements of the unified commands in evaluating the NBC readiness of assigned joint forces to fight and win in an NBC contaminated environment. The information in the module was developed based on an extensive review of the latest doctrine regarding joint and coalition warfare. The primary source document was Joint Publication 3-11, Joint Doctrine for Nuclear, Biological and Chemical (NBC) Defense, dated 10 Jul 95. The module is fashioned to present a series of questions that, when answered, provide insights into functional area readiness. The major topical headings generally relate to mission areas within the purview of the various Unified Combatant Command staffs.

Strategic Level OPLAN and Annex Module: The Strategic Level OPLAN and Annex Module contains example plans which address NBC considerations. The plans contained in this module should not be considered the only way of planning, nor should they be considered doctrine. Rather, they are a menu to allow planners to select responsible course of action. Of course, planners will expand on these examples and tailor the examples to their situations.

Universal Joint Task List Module: The Universal Joint Task List Module presents the U.S. Army Chemical School's analysis of the UJTL (dated 13 Sep 97). The analysis reveals that many NBC/WMD related tasks which are stated and /or implied within the UJTL. The tasks in this module are broken down into three levels: Strategic National, Strategic Theater, and Operational. The UJTL tasks are highlighted in purple and NBC tasks are highlighted in orange. Tasks that have stated NBC/WMD implications have the NBC portion underlined and the words "NBC Stated Task" denoted at the bottom of the screen. Tasks which have implied NBC tasks have the words "NBC Implied Task" and lists those tasks at the bottom of the screen. In the case of parent tasks, which include implied tasks, the implied task is listed as "Additional NBC Implied Tasks" in its submenu.

The U.S. Army Chemical School point of contact for the interactive CD-ROM is Major Scott Robinson at (205) 848-3925. The CBIAC TAT principle investigator for this project is Mr. Jim Coverstone, assisted by Dr. Mike Michelson and Mr. Rick Mettke. They may be reached at (205) 848-4757.

As an add-on to TAT 166, an NBC Tactical Version of the CD-ROM for field units world-wide is under development . It should be available Summer 1998.

ONGOING AND RECENT ACTIVITIES

Current Awareness and Promotions

• Barbara Hoffman attended the National Security Institute's **Impact '98** , held March 30-April 1, 1998, in Reston, Virginia.

• Representatives from the CBIAC attended and staffed our display at the **CB Mission Area APBI**, held April 1-2, 1998, at the Kossiakoff Center, Applied Physics Laboratory, Johns Hopkins University, in Laurel, Maryland. The APBI, hosted by the U.S. Army Chemical and Biological Defense Command (CBDCOM), encompassed CB programs from all services. Over 200 management, marketing, and technical representatives from industry heard acquisition requirements and specific contracting opportunities available over the next five years in CB defense areas such as detection, protection, decontamination, and chemical demilitarization. The CBIAC exhibit highlighted the products and services available to the CB defense community. CBIAC basic products were on hand for review.

• Richard Gilman represented the CBIAC at the **1998 Preempt Conference**, held April 4-6, 1998, at the Adam's Mark, in Philadelphia, Pennsylvania. See *Meeting Highlights* on page 8 for further details.

• Ron Evans will be attending the **Sixth International Symposium on Protection Against Chemical and Biological Warfare Agents**, scheduled for May 10-15, 1998, at the Stockholm City Conference Center, in Stockholm, Sweden.

• Representatives from the CBIAC will be attending the **1998 Joint Service Chemical & Biological Decontamination Conference**, scheduled for June 9-11, 1998, at the St. Petersburg Bayfront Hilton, in St. Petersburg, Florida. The CBIAC tabletop display will be on hand at the conference.

• The CBIAC will be highlighting Technical Area Task (TAT) work being done for the Defense Special Weapons Agency (DSWA) at the **DSWA 7th Annual International Conference on Controlling Arms**, to be held at the Wyndam Franklin Plaza Hotel, in Philadelphia, Pennsylvania, from June 8-11, 1998.

• The CBIAC will be attending the Worldwide Chemical Conference, scheduled for June23-25, 1998, at Fort McClellan, Alabama. The CBIAC will have an exhibit showcasing its products and services. CBIAC products will also be on display.

• The CBIAC is a co-sponsor of the Federal Emergency Management Agency (FEMA) 1998 Technology Partnerships for Emergency Management Workshop and Exhibition, being held July 20-23, 1998, at Argonne National Laboratory in Argonne, Illinois. Look for the CBIAC display at the conference.

Acquisition and Processing

A *Biological Weapons Treaty Reference Collection* is being compiled. When complete, it will be a subset within the CBIAC Bibliographic Database (BD). Anticipated completion date is December, 1998.

Inquiry and Referral Services

Last quarter, the CBIAC responded to 233 inquiries. Thirteen percent of the requestors sought information on NBC Survivability. Another twelve percent requested information on Individual and Collective Protection.

Technical Area Tasks (TATs)

Since the last newsletter, 16 new tasks were awarded, effort was added to 13 ongoing tasks, and five tasks have been completed. As of 31 March 1998, a total of 159 TATs have been awarded. Total value of TATs awarded is over 67 million dollars. The chart at the bottom of the page shows the percentage of TAT work sponsored by each branch of the armed forces for 2nd quarter FY98, along with the funding (in millions) provided by each organization.

For further information on a CBIAC TAT, contact Judith Shetterly, CBIAC Administrator. In order for us to help you most efficiently, please furnish your Government Contract Number (if any), the reason you are requesting the information, and your organization's address and telephone number. This information is needed in order to obtain the release of information from the TAT sponsor.

Completed:

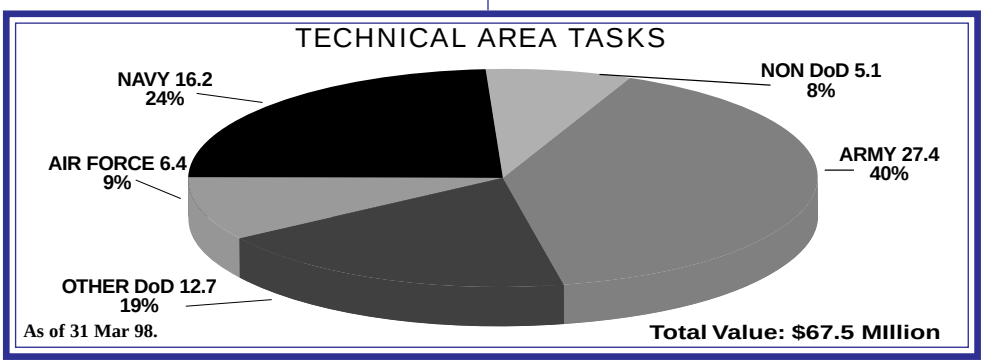
Task	Description/Sponsor
70	LVOSS Evaluation USA/CBDCOM
80	Evaluation Of Decontamination Process USAF/HSC
106	Inhalation Toxicity Data USA/ERDEC
181	Evaluate The USA-AMC Chemical OPLAN USA/ERDEC

Underway:

Task	Description/Sponsor
289	Determination of MDL for Lewisite in "Red" and "Charcoal" RR USA/ERDEC
295	US BW Program Historical Database DSWA/OPAC
303	US Navy CB-D Program, Technical, And Analytical Support USN/NAVSEA
304	Shipboard CBR System Post Milestone III ILS Planning USN/NAVSEA
307	Airport Canine Pilot Program FAA/Aviation Security R&D
309	1998 Scientific Conference On Obscuration And Aerosol USA/ERDEC

Ongoing and Recent Activities

Continued on page 9



CB NEWS EXCERPTS

The CBIAC has compiled a list of related CB news articles and taken excerpts from them to create brief overviews. The CBIAC does not provide secondary distribution of articles, but we can provide directions on where to find an article of interest. For further information contact Mary Frances Tracy (tracymf@battelle.org) at 410-612-6417.

Aldinger, Charles. *U.S. Ups Domestic Germ, Chemical War Defense*, **http://seek-p.infoseek.com/Content...warefare%29&col=NX&kt=A&ak=news1486** 18 March 1998. Defense Secretary William Cohen announced the military will create 10 new emergency teams to aid domestic agencies to respond quickly to attacks. The framework will include 22-member teams in the part-time National Guard which will increase the ability to assess quickly any threat within the U.S. from weapons of mass destruction. This initiative will bolster the standing Army and Marine Corps chemical/biological teams with a proposed $49.2M budget rise for fiscal 1999 starting in October. Secretary Cohen was quoted as saying, "This new initiative will be the cornerstone of our strategy for preparing America's defense against the possible use of weapons of mass destruction."

Higgins, Alexander. *Germ Warfare Treaty May Get Tougher*, **http://search.washingtonpost.com/wp-srv/WAPO/19980309/V000071-030998-idx.htm**, 11 March 1998. The European Union joined Australia and the U.S. in urging 130 nations to toughen the Biological and Toxins Weapons Treaty of 1972. Concern over Iraq's threat of germ warfare has brought about the desire to include verification procedures to the Treaty. Patrick Lamb, head of the British delegation, said the European Union had adopted the position that verification procedures should be reached by next year. Tibor Toth, chair of the negotiations at the U.N.'s European headquarters, indicated progress was being made but predicted the negotiations would continue until 2001.

Report: Soviets Had Tons of Anthrax, **http://search.washingtonpost.com/w...O/19980225/V000011-022598-idx.html**, 25 February 1998. In 1992, Dr. Kanatjan Alibekov defecting to the U.S. but prior to that he headed a branch of the Soviet biological weapons program. He is reporting that during the early 1980's the activities of the former Soviet Union included handling hundreds of tons of anthrax bacteria and many tons of smallpox and plague viruses. He has indicated these viruses could be mounted on intercontinental ballistic missile warheads within several days notice. Dr. Alibekov, now using the name Ken Alibek, reports that as of 1991, the Russian military had a working biological weapons program. This continued even though Mikhail Gorbachev and President Boris Yeltsin ordered the program stopped.

Drewen, Karen. *CBDCOM, SSCOM Form New Command*, **APG News**, 21 January 1998. Major General George E. Friel, commander of CBDCOM, announced that as of January 15, 1998, the U.S. Army Chemical and Biological Defense Command and the U.S. Army Soldier System Command were merged to create the U.S. Army Soldier and Chemical Biological Command - SCBCOM. Aside from the name change, the day-to-day operations will remain the same at the Edgewood Area organization. The new command will be fully operational on October 1, 1998.

Iraq Has Stockpiled Agent 15 Nerve Gas, **The Times**, 10 February 1998. According to the British Defence Secretary George Robertson, Iraq has built up large stocks of the nerve gas Agent 15. This nerve gas is designed to stupefy enemy forces by causing weakness, dizziness, disorientation, loss of coordination and hallucinations. Secretary Robertson indicated Agent 15 can be fired from missiles or put in water supplies. The nerve gas, a psychochemical similar to LSD, is designed to disorient rather than kill. Dr. Alastair Hay of Leeds University, an expert on chemical weapons, was quoted as saying, "In U.S. experiments, soldiers became so confused that they mistook friends for enemies, and began to talk to trees."

Vogel, Steve. *In Surburban Maryland, A Bulwark of Defense*, **http://www.washingtonpost.com/wp-s...te/1998-02/22/1661-022298-idx.html**, 25 February 1998. In the Maryland foothills of the Catoctin Mountains near Frederick, sits the focal point of the U.S. efforts in defense against biological warfare: Ft. Detrick. With a work force of 4,800 and an installation which covers 1,200 acres, it is the largest employer in Frederick. Ft. Detrick has its beginnings in the 1930s when a National Guard airfield was brought to the area and then a biological laboratory was opened during World War II (WWII) at Camp Detrick, the working name at the time. President Nixon's decision to discontinue the U.S. biological weapons program in 1969 led to the creation of the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) one of the many military medical orgaznizations based at Ft. Detrick. As the lead laboratory in the Department of Defense (DoD) for the medical aspects of biological defense, USARMIID develops vaccines, drugs, and diagnostics to protect the U.S. troops from biological warfare agents. Military training for managing biological casualties is also directed through USARMIID. However, USAMRIID expertise goes beyond the purely military. The material seized by the FBI from the men possessing anthrax in Las Vegas was tested at USARMIID. Additionally, USARMIID has recently responded to the concerns surrounding the effectiveness of the anthrax vaccine to be used to inoculate all U.S. troops. The scientists at USARMIID have also studied some of the deadliest viruses in the world, including the Ebola virus. Presently, work is continuing in the vaccine arena with the attempt to develop a new vaccine against botulinum toxin. Ft. Detrick and the Centers for Disease Control in Atlanta, GA, are the only two U.S. facilities with the "Biohazard Level 4" maximum-containment labs designation. These tightly sealed facilities have negative pressure air flow, which prevents air inside the labs from escaping to the outside. Since the air pressure is kept lower inside the labs than outside air will always flow into the lab in the unlikely event of a leak. All in all, the town of Frederick, the county government, and Ft. Detrick are accepting of one another and the citizens of the area feel secure relying on the outstanding safety record at Ft. Detrick.

CALENDAR OF EVENTS

The CBIAC highlights conferences, symposia, meetings, exhibitions and workshops of interest to the CB community in every issue of our newsletter and more extensively on the CBIAC homepage at <http://www.cbiac.apgea.army.mil/calendar.html>. We invite CBIAC users to submit information on various events to Judith A. Hermann (hermannj@battelle.org) at 410-612-6421. Due to space limitations, the CBIAC will accept submissions on a first-come, first-served basis and reserves the right to reject submissions.

May 17-21
1998 ASBMB Annual Meeting
Convention Center
Washington, DC
Contact(s): Federation of American Societies for Experimental Biology (FASEB)/OSMC
9650 Rockville Pike
Bethesda, MD 20814-3998
POC: Kristin Mirabal
Tel: (301) 530-7010 Fax: (301) 530-7014
E-Mail: kmirabal@osmc.fasb.org
URL: http://www.aai.org/asbmb/

May 28-29
A Strengthened Biological and Toxin Weapons Convention (BTWC): Potential Implications for Biotechnology
Institute of Applied Microbiology
Vienna, Austria
Contact(s): Safety in Biotechnology
European Federation Biotechnology (EFB)
Institue for Applied Microbiology
University of Agricultural Sciences
Muthgasse 18
A-1190 Vienna Austria
POC: Otto Doblhoff-Dier
Tel: +43-1+-36600-6204 Fax: 43-1-3697615
E-Mail: doblhoff@edv2booku.ac.at
URL: http://www.boku.ac.at/iam/efb/btwc.htm

May 31- June 4
1998 Medical Defense Bioscience Review
Marriott Hunt Valley Inn
Hunt Valley, MD
Contact(s): Sponser: The U.S. Army Medical Research and Material Command
Hosted by: The U.S. Army Medical Research Institute of Chemical Defense
3100 Ricketts Point Road
Aberdeen Proving Ground, MD 21010-5425
POC: Dr. Margaret Filbert or Mrs. Charlotte F. Albro
Tel: (410) 671-3628 or DSN: 584-3628
Fax: (410) 671-4147

June 1-3
Defense Modeling and Simulation Office Industry Days
Ritz Carlton Tyson's Corner
Vienna, VA
Contact(s): Defense Modeling and Simulation Office (DMSO)
National Training Systems Association (NTSA)
2111 Wilson Boulevard, Suite 400
Arlington, VA 22201
Meeting Reference: #81H
Tel: (703) 247-2569
Fax: (703) 243-1659
POC: Barbara McDaniel
Tel: (703) 522-1820 Fax: (703) 522-1885
E-mail: bmcdaniel@ndia.org
URL: http://www.adpansia.org
http://DMSTTIAC.HQ.IITRI.COM/CALENDAR/98-04-01-01.html

June 2-6
Eurosatory
Paris - Le Bourget
France
Contact(s): COGES
64 rue de Ranelagh
75016 Paris
France
Tel: 33 (0) 1 44 14 58 10
Fax: 33 (0) 1 42 30 70 88
E-Mail: coges@salon-eurosatory.fr
In the US, contact:
International Trade Exhibitions in France (ITEF)
2300 Clarendon Blvd, Suite 310
Arlington, VA 22201
Tel: (703) 522-5000 Fax: (703) 522-5005
http://www.salon-eurosatory.fr/anglais/welcome.html

June 8-11
Defense Special Weapons Agency (DSWA) 7th Annual International Conference on Controlling Arms
Wyndham Franklin Plaza Hotel
Philadelphia, PA
Contact(s): Center for Verification Research (CVR)
8500 Cinder Bed Road
P.O. Box 8500
Newington, VA 22122-8500
POC: Martha Newlon
Tel: (703) 333-5564
Conference Coordinator: Dr. Richard S. Soll (CVR)
Tel: (703) 333-5513
URL: http://www.dna.mil/dswaconf/control.htm

June 9-11
Chemical and Biological Decontamination Conference
St. Petersburg Bayfront Hilton
St. Petersburg, FL
Contact(s): Joint Service Materiel Group (JSMG)
Building E5101 Rm. 253
Aberdeen Proving Ground, MD 21010
Attn: AMSCB-EO(JSMG)
POC: Jeff Taylor
Tel: (410) 612-7467 Fax: (410) 671-3742
E-mail: jstaylor@cbdcom.apgea.army.mil

June 15-18
21st Army Science Conference
Norfolk Convention Center
Norfolk, VA
Contact(s): Department of the Army
Attn: SARD-TR/Catherine Kominos
103 Army Pentagon
Washington, DC 20310
POC: Dan Oimoen
Tel: (703) 697-3558 Fax: (703) 695-3600

June 22-25
International Chemical Demilitarization Conference
Bornsmouth, England
Contact(s): Sponsored by ICF Kaiser (US), DERA (UK), US DoD, and UK MOD.
ICF Kaiser International, Inc.
Julian D. Wynnyckyj
9300 Lee Highway
Fairfax, VA 22031
Industry POC: Orest Kaczmarskyi
E-mail: 74761.650@compuserve.com

June 23-25
Joint Worldwide Chemical Conference XVI And NBC Operations Symposium
"NBC Force Protection - Full Spectrum Support"
U.S. Army Chemical School
Fort McClellan, AL
Contact(s): U.S. Army Chemical School
Fort McClellan, Alabama
Meeting Reference: # 830
POCs: MAJ Amann and SFC Smith
Tel: (205) 848.6280/6340
Fax: (205) 848-4022
E-mail: wwcc@mcclellan-cmls.army.mil
and
The National Defense Industrial Association (NDIA)
2111 Wilson Boulevard, Suite 400
Arlington, Virginia 22201
NDIA POC: Angie DeKleine
Tel: (703) 247-2586
Fax: (703) 522-1885
E-mail: adekleine@ndia.org
URL: http://www.mcclellan.army.mil/usacmls/wwcc/wwcinde.htm

June 24-26
AUSA Spring Symposium & Exhibition
"Army and Industry: Synergy for 21st Century Success"
Pasadena, CA
Contact(s): Association of the U.S. Army (AUSA)
2425 Wilson Boulevard
Arlington, VA 22201
POC: Ms. Diane Fitzgerald
Tel: (703) 841-4300, ext 661
Fax: (703) 243-2589
E-mail: dfitzgerald@ausa.org

June 26-July 1
Disaster Forum '98
"Greater Global Partnerships-Creating Solutions"
Greater Edmonton Convention Center
Edmonton
Alberta, Canada
Contact(s): Disaster Forum '98
11215 Jasper Ave., Suite 437
Edmonton, Alberta
Canada T5K 0L5
Fax: (403) 422-1549
URL: http://www.freenet.edmonton.ab.ca/disaster/

June 30 - July 2
2nd Annual Green Chemistry & Engineering Conference: Global Perspectives
National Academy of Sciences
Washington, DC
Contact(s): 1998 Green Chemistry and Engineering Conference
c/o American Chemical Society
Meetings Department - #416
1155 16th Street, N.W.
Washington, DC 20036
Tel: (202) 872-6286 Fax: (202) 872-6013
E-mail: d_ruddy@acs.org
URL: http://www.acs.org/meetings/gcec98.htm

July 20-23
FEMA 1998
"Technology Solutions for Emergency Management Challenges"
Argonne National Laboratory
Argonne, IL
Contact(s): Argonne National Laboratory
Technical Support Working Group
9700 South Cass Avenue
Argonne, IL 60439
Meeting Reference: # DIS/900
POC: FEMA Conference Coordinator
Tel: (800) 752-6367
URL: http://www.fema.dis.anl.gov/info.html

August 9-14
Gordon Research Conference on Illicit Substance Detection: Chemical and Biological
Salve Regina University
Newport, Rhode Island
Contact(s): Gordon Research Conferences
University of Rhode Island
P.O. Box 984
West Kingston, Rhode Island 02892-0984
Tel: (401) 783-4011
Fax: (401) 783-7644
POC: Melody Allen
E-mail: melody@grcmail.grc.uri.edu
URL: http://www.grc.uri.edu/progra~2/illicit.htm

August 17-21
Annual Wargame
Newport, RI
Contact(s): National Defense Industrial Association (NDIA)
2111 Wilson Boulevard, Suite 400
Arlington, Virginia 22201
POC: Jean Kohlmeyer
Tel: (703) 522-1820
Fax: (703) 522-1885
E-mail: jkohlmeyer@ndia.org

August 18
Third Tri-Service Environmental Technology Workshop
"Environmental Technology: Preserving the Balance"
The Town and Country Hotel & Conference Center
North Mission Valley, CA
Contact(s): The U.S. Army Environmental Center Science and Technology Corporation
ATTN: ETW'98
101 Research Drive
Hampton, VA 23666-1340
POC: Ms. Sonya L. Herrin
Tel: (757) 865-7604
Fax: (757) 865-8721
E-mail: herrin@stcnet.com
URL: http://www.stcnet.com/meetings/etw98.html

August 23-27
ACS 1998 Fall Meeting
Hynes Convention Center
Boston, MA
Contact(s): American Chemical Society (ACS)
American Chemical Society Meetings Department
1155 Sixteenth Street, N.W.
Washington, D.C. 20036
Tel: (202) 872-4396
Fax: (202) 872-6128
E-mail: natlmtgs@acs.org
BIOT Division POC: Brian Hubbard
E-mail: bhubbard@genetics.com
http://calvin.biotech.wisc.edu/ACS_BIOT/index.html

MEETING HIGHLIGHTS

PREEMPT Conference
On Medical Domestic Preparedness Against CBN (Chemical, Biological, & Nuclear) Terrorism.
Philadelphia, PA, April 4-6, 1998
by Richard Gilman

PREEMPT Medical Counter-Terrorism, Inc. is a Not-For-Profit Corporate Organization created by Kenneth M. Berry, M.D., President of the American Academy of Emergency Physicians. Founded in 1997, its mission is 'the development, and training of Emergency Medical Personnel in response protocols for/to foreign or domestic terrorist attacks using Chemical, Biological and/or Nuclear weapons.' PREEMPT's annual conference's seek to promote this mission.

The first day of the conference focused on the current political climate regarding the threat of NBC terrorism and issues associated with coping with nuclear terrorism.

The themes of the second and third days were the biological and chemical weapons threat, respectively. Sessions included presentations on Anthrax, Plague, Pox viruses, toxins, the implications of a biological agent attack, biological agent decontamination, nerve agents, pulmonary intoxicants, cyanide, riot control agents, vesicants, and chemical casualty triage.

Highlights included workshops utilizing sophisticated computer software to simulate the effects of anthrax and sarin attacks on San Francisco and Washington, D.C, respectively, and presentations by LTC George Christopher, M.D. of USAMRIID, Kenneth M. Berry, M.D., and CMDR Richard Dalton, M.D., Marine Corps, CBIRF.

Canadian R&D in Medical Countermeasures against Biological Warfare Agents

Canadian research to develop medical countermeasures against Biological Warfare (BW) agents is conducted at the Defence Research Establishment Suffield (DRES), in Alberta. While the program is small in terms of resources, it is strongly focussed on areas where Canada can make a significant contribution. To avoid duplication of effort, the Canadian research is closely coordinated with that of the US, UK and Australia through The Technical Cooperation Program (Subgroup E).

Vaccination is obviously the best means of protecting troops against BW agents and DRES is actively researching some novel approaches to vaccine development. For example, a polysaccharide material isolated from the membrane of Brucella abortus has been shown to confer immunity against all of the Brucella species. Field trials with swine conducted for DRES in Venezuela under the auspices of the United Nations University showed that only a small amount of the antigenic material, as little as 0.1 mg, was required and it could be given as a single dose, orally or by injection. As another example, contract research with the Veterinary Infectious Diseases Organization (VIDO) in Saskatchewan has found a way to adapt a commercial vaccine for plague to a mucosal vaccine. Challenge studies are planned to determine whether the mucosal form is more effective in enhancing immunity at the sites of entry for BW agents.

An alternative to immunization against specific BW agents, is to raise the level of non-specific immunity. The pharmaceutical industry has for some time been investigating drugs with immunomodulating properties and some of these are already in clinical use, or are close to this stage in their development. The intention is to evaluate the best of these against BW agents in the biocontainment facility at DRES, starting with anthrax (for which proof-of-concept has already been obtained) and plague. Since the pharmaceutical industry will bear the burden of obtaining new drug approval for their own purposes, the savings for Canada in time and money are obvious.

After exposure, in the period before the onset of illness, therapy with antibiotics and antibodies can be effective. Research at DRES on passive immunity focuses on the viruses which cause the various forms of equine encephalitis. The approach being taken is to clone antibodies from human volunteers who have received an experimental vaccine for Western Equine Encephalitis. After the gene for antibody expression is isolated from their lymphocytes, it will be incorporated into a fast growing organism, such as bacteria or yeast. In this way it will be possible to produce large quantities of "humanized" antibodies that will not cause the serum sickness often seen when animals are used to produce the traditional antibodies.

Work at DRES has shown that liposome encapsulated antibiotics (e.g., ciprofloxacin) can be used to treat infections from Brucella and Francisella tularensis in laboratory animals. This treatment is effective because both organisms locate themselves within the tissue cell and liposome encapsulation seems to help transport the antibiotic across the cell membrane. Since the route of entry for BW agents is normally through the lungs, the intention is to field encapsulated antibiotics as an inhaled preparation similar to that used by asthmatics. This work has now progressed to an investigation of encapsulated antivirals and a similar increase in effectiveness over the unencapsulated drug has been observed.

Medical countermeasures research at DRES is carried out in level II and III biocontainment facilities which have been completely refurbished and have considerable spare capacity. Through contract research, the program draws on the expertise of world class scientists at Canadian universities, some of whom are also funded by the US DoD to conduct medical countermeasures research in the biocontainment facilities at DRES.

When the R&D program generates a product for the marketplace, DRES looks for partnership opportunities with industry, at home or abroad. A current example is the requirement to find a Canadian partner capable of producing vaccines of military significance for the global market, starting with a Brucella vaccine based on the research done at DRES.

For more information on Canada's medical countermeasures program, contact Mr Clement Laforce, Head of Business Development (403-544-4733; E-mail: Clement.Laforce@dres.dnd.ca).

NEW ACQUISITIONS

The following acquistions may be reviewed at the CBIAC. Further information on how to obtain or review any of the listed acquisitions is included for your convenience. If you would like further detail, please contact Richard M. Gilman (gilman@battelle.org) at 410-612-6415. The CBIAC is not authorized to distribute duplicates of the listed acquisitions.

Ali, Javed, Leslie Rodrigues and Michael Moodie. **Jane's U.S. Chemical-Biological Defense Guidebook**. Alexandria, Virginia: Jane's Information Group, 1997, pp. 458.

"A complete guide to the agencies involved in chemical and biological weapons defence systems and organisations in the United States. This volume includes information on chemical and biological weapons and their effects, delivery systems and methods, detection, sensors, countermeasures…medical response equipment, past and current budgets, defensive training procedures and crisis response plants."

Intended audience includes civil defense forces, municipal authorities, law enforcement agencies, emergency medical services, hospitals and military agencies.

CB-102919.01
D 756258
ISBN 0-7106-1646-5
Jane's Information Group
1340 Braddock Place, Suite 300
Alexandria, Virginia 22314-1651
(703) 683-3700

Marrs, Timothy C., Robert L. Maynard and Frederick Sidell. **Chemical Warfare Agents—Toxicology and Treatment**. Chichester: John Wiley & Sons, 1996, pp. 234.

"This book aims to cover the toxicology of the major groups of classical chemical warfare agents, including mechanisms of action, pathology and treatment of the resultant poisoning. Emphasis is placed upon the more practical aspects of treatment including the particular difficulties of treatment in the field. The book will be of interest to all of those in the chemical warfare field including armed forces health care professionals, those engaged in civil defense planning and scientists working in the field. Some parts of the book will interest groups such as respiratory toxicologists. The chapters on organophosphate nerve agents may profitably be studied by those dealing with other types of organophosphate compounds, such as those used as pesticides."

CB-102407.01
D 755994
ISBN 0-471-95994-4
John Wiley & Sons, Inc.
605 Third Avenue
New York., N.Y. 10158-0012
(212) 850-6276

SIPRI (Stockholm International Peace Research Institute). **SIPRI Yearbook 1997: Armaments, Disarmament and International Security**. Oxford: Oxford University Press, 1977, pp. 565.

"The 28th edition of the SIPRI Yearbook analyses developments in 1996 in security and conflicts, military spending and armaments, non-proliferation, arms control and disarmament with extensive annexes on arms control and disarmament agreements and a chronology of security- and arms control-related events."

Special studies in this volume include the Middle East Peace Process, "Russia: conflicts and its security environment," military research and development, dual-use technology export control measures, and chemical and biological arms control.

CB-102412-01
D755700
ISBN 0-19-829312-7
Oxford University Press
2001 Evans Road
Cary, NC 27513
1-800-451-7556

Ongoing and Recent Activities

Continued from page 4

314 Concept Evaluation And Techical Support For The XM279
USA/CBDCOM

319 Non-Lethal Rigid Foam
USA/ERDEC

321 Assessment Of The Use Of Canines To Detect BW Agents
USA/CBDCOM

322 NBC Defense JSIG Technical Support
USA/CMLS

323 Technical Support to OASD (CP&CBD)
OASD (CP&CBD)

326 Literature Search Into Background Of NAEDS
USA/ERDEC

338 NATO Working Group Conference – Decon
USA/ERDEC

340 Identification And Delineation Of Background Hydrocarbons
USA/Corps of Engineers

CBIAC STATISTICS

Total CBIAC documents accessible through DTIC DROLS: 8,657

Shared[1]: 4,975 Unique[2]: 3,682

Total documents added to the CBIAC BD during Second Quarter, FY98: 615

Total document citations available through the CBIAC BD: 52,080.

Total documents on site: 30,638

Total inquiries received during Second Quarter, FY98: 233

Technical: 54 Informational: 45
Bibliographic: 131 Referral: 3

Total TATs awarded since contract initiation: 159

Completed: 66 Ongoing: 93

Total newsletter subscribers: 2,490

1 Existing DTIC records appended with CBIAC terms
2 New DTIC records created by the CBIAC

SELECTED INQUIRY RESPONSES

This section of the newsletter contains selections of recent technical inquiries and responses on subjects we feel are of interest to the users. The information presented has been edited to conserve space. If you would like further detail, contact Andrew Blackburn (blackbua @battelle.org) at 410-612-6411 or Mary Francis Tracy (tracymf@battelle.org) at 410-612-6417. Please provide the reference number if available.

Q: What Internet sites are available as informational resources for CB defense?

CB Warfare Overviews:

- **http://www.calpoly.edu/~drjones/chemwarf.html**
  Cal Poly CBW Page

- **http://www.csis-scrs.gc.ca/eng/miscdocs/tabintre.html**
  Chemical and Biological Terrorism: The Threat According to the Open Literature

- **http://www.ca.sandia.gov/outreach/2020/biofaq.html**
  General Questions about Biological Weapons

- **http://www.ca.sandia.gov/outreach/2020/chemfaq.html**
  General Questions about Chemical Weapons

- **http://www.sciam.com/1296issue/1296cole.html**
  The Specter of Biological Weapons [A Scientific American article with links to other sites]

CB Agents:

- **http://www.efni.com/~brownl/nerve.htm**
  Nerve Agents from A FOA Briefing Book on Chemical Weapons

- **http://www.outbreak.org/cgi-unreg/dynaserve.exe/cb/bionews.html#swat**
  A Compilation of News Items About CB Agents and Threats

- **http://www.nbc-med.org/**
  Current News from the Nuclear Biological and Chemical Medical web page

- **http://www.cnd.org:8000/njmassacre/recent-news2.html**
  Germ warfare timeline

- **http://www.tulane.edu/~dmsander/garryfavwebbw.html**
  "All the Virology on the WWW" from the Garry Laboratory, Department of Microbiology and Immunology, School of Medicine at Tulane University

- **http://www.mitretek.org/offer/energy/cw_page/cwagent.html**
  The CW Page: the Definitive Reference on Chemical Warfare Agents and Their Properties and Degradation Rates

- **http://www.ama-assn.org/sci-pubs/journals/archive/jama/vol_278/no_5/toc.htm#top**
  August 6, 1997 JAMA issue on Biological Warfare

Medical Effects and Treatment:

- **http://chemdef.apgea.army.mil/TBMed296/TBMed296.htm**
  Technical Bulletin: Assay Techniques for Detection of Exposure to Sulfur Mustard, Cholinesterase Inhibitors, Sarin, Soman, GF, and Cyanide

- **http://www.nbc-med.org/amedp6**
  Handbook on the Medical Aspects of NBC Defensive Operations FM 8-9 (contains information on infectivity, transmissibilty, persistance, methods of dissemination, ...)

- **http://chppm-www.apgea.army.mil/scidir/docs.htm**
  Detailed Chemical Facts Sheets or General Chemical Facts Sheets

- **http://www.amasys.com/wmd.htm**
  Weapons of Mass Destruction by Agent Includes:
  Overview, History/Military Relevance, Physical Characteristics. Mechanisms of Toxicity, Clinical Effects, Differential Diagnosis, Laboratory Findings, Medical Management

- **http://www.gulflink.osd.mil/dsbrpt/**
  Report of the Defense Science Board Task Force on Persian Gulf War Health Effects

- **http://www.mod.uk/gulfwar/gvi.htm**
  Gulf Veteran's Illnesses

- **http://chemdef.apgea.army.mil/chemcasu/titlepg.htm**
  United States Army Medical Research Institute of Chemical Defense: Medical Management of Chemical Casualties Handbook

- **http://www.outbreak.org/cgi-unreg/dynaserve.exe/index.html**
  "Outbreak is an on-line information service addressing emerging diseases."

Contract Awards

1. Decontamination Agent, STB
   Los Angeles Chemical Company
   4545 Sardine
   South Gate, CA 90280
   $151,417. January 2, 1998

2. CB Protective Multipurpose Overboots (MULO)
   Tingley Rubber Corporation
   South Plainfield, New Jersey 07061
   (Sole Source Contract for 200,000 MULO over the next 3 years)
   By Marine Corps System Command

3. Oxygen Mask
   Scott Aviation
   Division of Figge International
   225 Erie Street
   Lancaster, NY 14086-9502
   $67,914. January 20, 1998
   By DSCC-Columbus

4. Joint Chemical Agent Detector
   Tracor Aerospace, Inc
   6500 Tracor Lane
   Austin, TX 78725-2070
   $4,735,959. February 27, 1998
   By HSC/YAK, Brooks AFB

User Survey FY98

Please do not forget to fill out the 1998 CBIAC User Survey that appeared in last issue of the *CBIAC Newsletter.*

Your comments and ideas are not only appreciated but are needed so that the CBIAC may continue to provide you with the information and services that best meet the needs of the CB defense community.

If you need a copy of the survey, you can get one on our web page at **http://www.cbiac.apgea.army.mil/** or by contacting Ms. Mary Jo Waters at (410) 612-6418.

In Memorium

We report with great sadness that on April 19, Brian McCabe, Senior Program Analyst for DTIC's Information Analysis Center (IAC) Program Office, was stricken by a heart attack and passed away at his home in Bethesda, MD. He was 51 years old.

Brian began his career at DTIC in 1976 as an intern. Loyal, dedicated and hard working, he was greatly admired by all who had the privilege of working with him, and was instrumental in developing the IAC program into the well-run business enterprise it is today.

DTIC, the CBIAC, and all who knew Brian were saddened to learn of his untimely death. His survivors include his wife, Mary Ellen; his parents, Ernest and Constance; three brothers, Gary, Bruce, and Andy; a sister, Katie; and six nieces and nephews. Expressions of sympathy may be forwarded to Mary Ellen McCabe, 6020 Avon Drive, Bethesda, MD 20814.

"Analysis and Validation: A Perspective for Hazard Models"

Continued from page 2

rules or puff splitting "rules of thumb" may also be profitably examined to determine how carefully these might be chosen. For model comparisons, direct cross-checking can be made for any common output and input variables, and valid relative performance data obtained. Whatever the level of model abstraction or complexity chosen for study, a standard calibration or simple perturbation of a model in light of field trial data can only increase the modeler's knowledge of their product, and increase confidence in its ability to predict real events with some now-quantified fidelity. Art is often found close to mathematics, and modeling will always require its own peculiar artistry, which almost always evades the process of numeration. Yet as we have seen, the fidelity of numerical NBC hazard models is a matter of the gravest concern for human life and environmental quality. The discipline demands all the cooperative study and due diligence we can muster to address the challenges that lie ahead.

Note: This article expresses the personal opinions and views of the author, and does not represent the policy or opinions of any public or private organizations.

REFERENCES CITED

1 - Judge, G. et al. The Theory and Practice of Econometrics, 1980, J. Wiley & Sons, New York.

2 - Troutman, B. M. "Errors and Parameter Estimation in Precipitation Runoff Modeling 1. Theory", 1985, Water Resources Research, (21:8), 1195.

3 - Merkle, P.B., W.R. Knocke, D.L. Gallagher, and J. Little, "Dynamic Model for Soluble Mn2+ Removal by Oxide-Coated Filter Media", J. Environmental Engineering Division, ASCE, 123(7):650-658, July, 1997.

Dr. Merkle holds the doctorate in Civil Engineering (Virginia Tech '95), M.S. in Chemical Oceanography (Stony Brook '91), and B.S. degrees in Management and Chemical Engineering (M.I.T. '84). He may be reached at merklepb@acq.osd.mil.

Chemical and Biological Defense Information Analysis Center
CBIAC
Serving the CB Defense Community

The **CBIAC Newsletter** is a quarterly publication of the Chemical Warfare/Chemical and Biological Defense Information Analysis Center (CBIAC). The CBIAC is a Department of Defense (DoD) Information Analysis Center (IAC), administratively managed by the Defense Technical Information Center (DTIC) under the DoD IAC Program Office.

Government agencies and private industry under contract to the Department of Defense can contact the CBIAC for informational products and services. The CBIAC serves as the center for the acquisition, compilation, analysis and dissemination of information relevant to chemical warfare and chemical and biological defense technology.

The CBIAC is located in Building E3330, Aberdeen Proving Ground - Edgewood Area, Maryland 21010. For further assistance or information, visit or contact the CBIAC Monday through Friday from 8:00 a.m. to 4:00 p.m., EST:

Mailing Address: CBIAC
P.O. Box 196
Gunpowder Branch,
APG, MD 21010-0196

Tel: 410-676-9030 *Fax:* 410-676-9703
E-mail: cbiac@battelle.org
URL: http://www.cbiac.apgea.army.mil/

CBIAC POINTS OF CONTACT

Ronald L. Evans, *Director*
Tel: 410-612-6410 *E-Mail:* evansrl@battelle.org

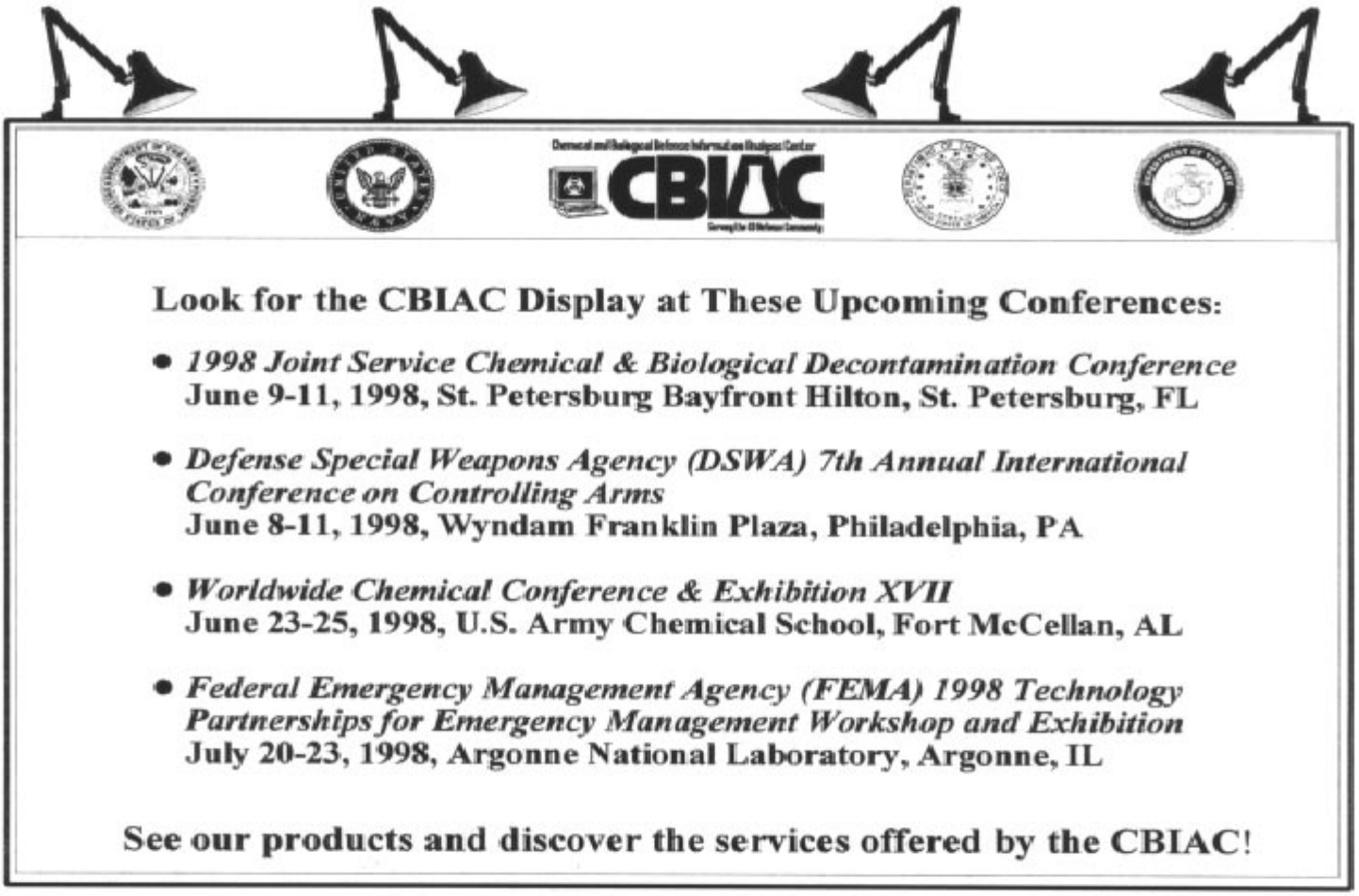
Janice E. Rhodes, *Manager, Technical Area Tasks*
Tel: 410-612-6423 *E-Mail:* rhodesj@battelle.org

James M. King, *Deputy Director*
Tel: 410-612-6420 *E-Mail:* kingj@battelle.org

Donald B. McGonigle, *Information Support Systems*
Tel: 410-569-0200 *E-Mail:* mcgonigle@battelle.org
Richard M. Gilman, *Information Acquisition*
Tel: 410-612-6415 *E-Mail:* gilman@battelle.org
Jeanne M. Rosser, *Information Processing*
Tel: 410-612-6419 *E-Mail:* rosserj@battelle.org
Andrew R. Blackburn, *Inquiry and Referral Services*
Tel: 410-612-6411 *E-Mail:* blackbua@battelle.org
Mary Jo Waters, *Current Awareness & Promotions; Newsletter Editor*
Tel: 410-612-6418 *E-Mail:* watersm@battelle.org
Judith M. Shetterly, *CBIAC Administrator*
Tel: 410-612-6412 *E-Mail:* shetterj@battelle.org

The Contracting Officer's Technical Representative for the CBIAC is Mr. Joseph D. Williams. He can be reached through his E-Mail address at jdwillia@cbdcom.apgea.army.mil or at the following address:

Technical Director, ERDEC
Attn: SCBRD-RTA (Mr. Joseph Williams)
APG-EA, MD 21010-5423



CBIAC
P.O. Box 196
Gunpowder Branch APG, MD 21010-0196

Non-Profit
U.S. Postage
Paid
Edgewood, MD
Permit No. 14

Printed on recycled paper.